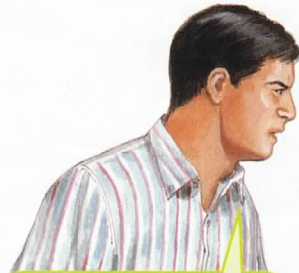


- Water and nutrients
- Roots and root hairs
- Moving water around a plant



Why water?

Jamal's in trouble. His parents have got back from holiday, and their plants have drooped. Jamal was supposed to have watered them every day, but he didn't think it was important and he forgot.



Don't you realise that plants need water for photosynthesis?



And you were supposed to put fertiliser in the water to give the plants nutrients to keep them healthy.



a What do plants use water for?

What do roots do?

Roots are plant organs that grow deep into the soil. They have two main functions:

- They take in water and nutrients.
- They hold the plant firm in the soil.

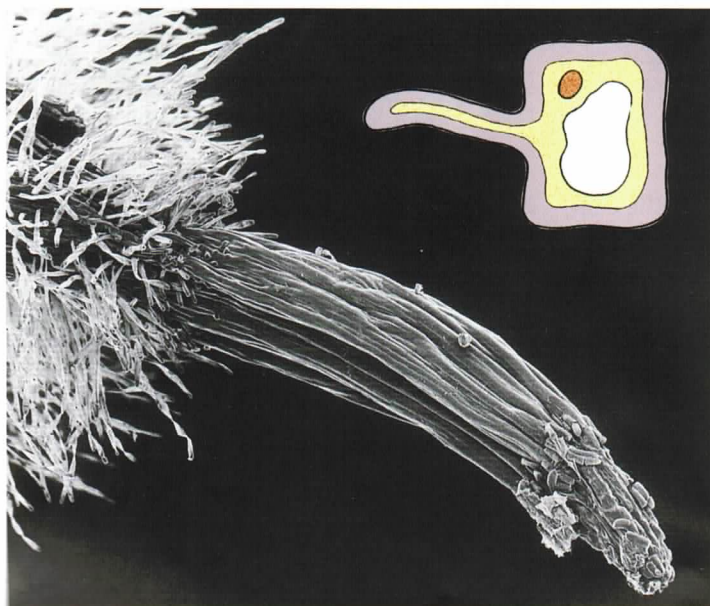
Roots get thinner and thinner as they spread out. The very tips of roots have many tiny parts called **root hairs**.

Root hairs are long, thin parts of specialised cells called root hair cells. Root hairs stick out into the soil, giving a large surface area, which helps the roots take in water from the soil more quickly.



There are nutrients dissolved in the water in the soil, and the roots take in these nutrients along with the water. To increase the supply of nutrients, some gardeners also add **fertiliser** to the water. Fertiliser contains dissolved nitrates, phosphates and potassium, which all help to keep plants healthy.

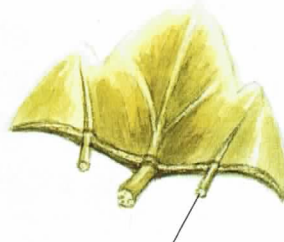
- b**
- What is the function of root hair cells?
 - Explain how they are specialised to carry out their function.



Reaching all parts

Once in the roots, water is carried up through the stem and into the leaves and flowers by tubes called veins. If you stand a plant in red dye, you can see the movement of water through the veins. If you cut a slice out of the stem, the red dye shows up in the veins. The celery stem in this photo shows this.

vein in stem



vein in leaf

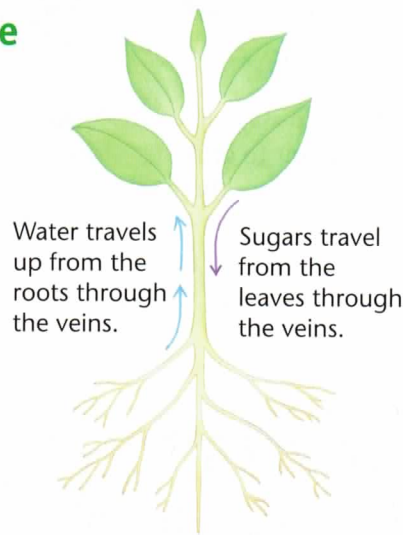


All cells need water and glucose

Although plants need water, they don't need too much. If the roots have too much water around them, the root cells won't get any oxygen and will die. Just like other living cells, root cells need oxygen to respire.

Veins carry water and nutrients up the plant stem to the leaves, where the water is used for photosynthesis to make glucose.

If you don't water a plant, it wilts and goes floppy. Plants stay upright because every cell is full of water, keeping it rigid. You can see a cell from a healthy plant and a cell from a wilting plant in the picture on the right.

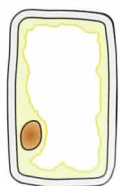


Did you know?

Some parts of a plant are almost all water. A ripe tomato is about 95% water.



Cell from wilting plant.



Cell from watered plant.

c What happens if you: (i) underwater (ii) overwater a plant?

Most glucose is made in the palisade cells, but all the plant's cells need glucose for respiration. To move around the plant, glucose is turned into sucrose. The sucrose dissolves in water and travels through the veins to other parts of the plant, where it can be used by the cells.

d Why does glucose need to be transported around the plant?

Questions

- 1 **a** Imagine you are a water droplet. Explain the route you take from the soil to a palisade cell in the leaf.
- b** Write down two reasons why a palisade cell needs water.
- 2 Maria was repotting a plant, and started examining its roots. Explain the answers to her questions:
 - a** Why do roots spread out and get thinner and thinner?
 - b** Why is it important for roots to have a large surface area?
 - c** How do root hairs increase the surface area of roots?

For your notes:

- Plants need water and nutrients.
- Roots take in water and nutrients, and hold a plant firm in the ground.
- Root hairs have a large surface area to help roots take in a lot of water and nutrients.
- Water and nutrients are transported to all parts of a plant in the veins.